

# HORN SYSTEMS

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## DESCRIPTION AND OPERATION

### HORN SYSTEM

#### DESCRIPTION

A dual-note electric horn system is standard factory-installed equipment on this model. The standard equipment horn system features one low-note horn unit and one high-note horn unit. The horn system uses a non-switched source of battery current so that the system will remain functional, regardless of the ignition switch position. The horn system includes the following components:

- Clockspring
- High-line Central Timer Module (CTM)
- Horns
- Horn relay
- Horn switch

Refer to **Clockspring** in the Description and Operation section of Group 8M - Passive Restraint Systems for more information on this component. Refer to **Central Timer Module** in the Description and Operation section of Group 8E - Instrument Panel Systems for more information on this component. Refer to **Horn/Cigar Lighter/Power Outlet** in the Contents of Group 8W - Wiring Diagrams for complete circuit diagrams. Following are general descriptions of the remaining major components in the horn system.

#### OPERATION

The horn system is activated by a horn switch concealed beneath the driver side airbag module trim cover in the center of the steering wheel. Depressing the center of the driver side airbag module trim cover closes the horn switch. Closing the horn switch activates the horn relay. The activated horn relay then switches the battery current needed to energize the horns.

Refer to the owner's manual in the vehicle glove box for more information on the features, use and operation of the horn system.

#### CENTRAL TIMER MODULE

The high-line Central Timer Module (CTM) can also operate the horn system. A high-line CTM is used on high-line versions of this vehicle. The CTM combines the functions of a chime/buzzer module, an intermittent wipe module, an illuminated entry module, a remote keyless entry module, and a vehicle theft security system module in a single unit.

The high-line CTM also controls and integrates many of the additional electronic functions and features included on models with this option. The horn relay is one of the hard wired outputs of the CTM. The high-line CTM is programmed to energize or de-energize the horn relay in response to certain inputs from the Remote Keyless Entry (RKE) system and/or the Vehicle Theft Security System (VTSS).

Refer to **Central Timer Module** in the Description and Operation section of Group 8E - Instrument Panel Systems for more information on the high-line CTM. Refer to **Remote Keyless Entry System** in the Description and Operation section of Group 8P - Power Lock Systems for more information on the RKE system. Refer to **Vehicle Theft Security System** in the Description and Operation section of Group 8Q - Vehicle Theft/Security Systems for more information on the VTSS.

### HORN

#### DESCRIPTION

The dual electromagnetic diaphragm-type horns are standard equipment on this model. Both horns are mounted on a single bracket that is secured to the front of the left vertical member of the radiator support, just behind the radiator grille and forward

## DESCRIPTION AND OPERATION (Continued)

of the radiator. The high-note horn is connected in parallel with the low-note horn. The horns are connected to the vehicle electrical system through the headlamp and dash wire harness. Each horn is grounded through its wire harness connector and a ground circuit to an eyelet terminal secured by a ground screw located on the right front inner fender behind the right headlamp, and receives battery current through the closed contacts of the horn relay.

Both horns and the mounting bracket are serviced as a single unit. The horns cannot be repaired or adjusted and, if faulty or damaged, the entire horn and bracket unit must be replaced.

## OPERATION

Within the two halves of the molded plastic horn housing are a flexible diaphragm, a plunger, an electromagnetic coil and a set of contact points. The diaphragm is secured in suspension around its perimeter by the mating surfaces of the horn housing. The plunger is secured to the center of the diaphragm and extends into the center of the electromagnetic coil. The contact points control the current flow through the electromagnet.

When the horn is energized, electrical current flows through the closed contact points to the electromagnet. The resulting electromagnetic field draws the plunger and diaphragm toward it until that movement mechanically opens the contact points. When the contact points open, the electromagnetic field collapses allowing the plunger and diaphragm to return to their relaxed positions and closing the contact points again. This cycle continues repeating at a very rapid rate producing the vibration and movement of air that creates the sound that is directed through the horn outlet.

## HORN RELAY

### DESCRIPTION

The horn relay is a electromechanical device that switches battery current to the horn when the horn switch grounds the relay coil. The horn relay is located in the Junction Block (JB), on the left end of the instrument panel in the passenger compartment. If a problem is encountered with a continuously sounding horn, it can usually be quickly resolved by removing the horn relay from the JB until further diagnosis is completed. See the fuse and relay layout label affixed to the inside surface of the fuse access panel for horn relay identification and location.

The horn relay is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions

are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The horn relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

### OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

## HORN SWITCH

### DESCRIPTION

A center-blow, normally open, resistive membrane-type horn switch is secured with heat stakes to the back side of the driver side airbag module trim cover in the center of the steering wheel (Fig. 1). The switch consists of two plastic membranes, one that is flat and one that is slightly convex. These two membranes are secured to each other around the perimeter. Inside the switch, the centers of the facing surfaces of these membranes each has a grid made with an electrically conductive material applied to it. One of the grids is connected to a circuit that provides it with continuity to ground at all times. The grid of the other membrane is connected to the horn relay control circuit.

The steering wheel and steering column must be properly grounded in order for the horn switch to function properly. The horn switch is only serviced as a part of the driver side airbag module trim cover. If the horn switch is damaged or faulty, or if the driver side airbag is deployed, the driver side airbag module trim cover and horn switch must be replaced as a unit.

### OPERATION

When the center area of the driver side airbag trim cover is depressed, the electrically conductive grids on the facing surfaces of the horn switch membranes contact each other, closing the switch circuit. The

DESCRIPTION AND OPERATION (Continued)

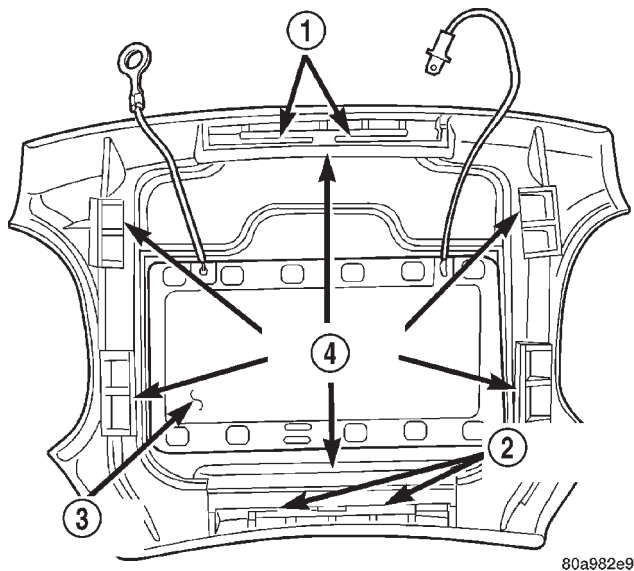


Fig. 1 Driver Side Airbag Module Trim Cover and Horn Switch

- 1 - RETAINER SLOTS
- 2 - RETAINER SLOTS
- 3 - HORN SWITCH
- 4 - LOCKING BLOCKS

completed horn switch circuit provides a ground for the control coil side of the horn relay, which activates the relay. When the horn switch is released, the resistive tension of the convex membrane separates the two electrically conductive grids and opens the switch circuit.

DIAGNOSIS AND TESTING

HORN RELAY

The horn relay (Fig. 2) is located in the Junction Block (JB) on the left end of the instrument panel in the passenger compartment of the vehicle. If a problem is encountered with a continuously sounding horn, it can usually be quickly resolved by removing the horn relay from the JB until further diagnosis is completed. See the fuse and relay layout label affixed to the inside surface of the fuse access panel for horn relay identification and location. For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

- (1) Remove the horn relay from the JB. Refer to **Horn Relay** in the Removal and Installation section of this group for the procedures.
- (2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.
- (3) Resistance between terminals 85 and 86 (electromagnet) should be  $75 \pm 5$  ohms. If OK, go to Step 4. If not OK, replace the faulty relay.
- (4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

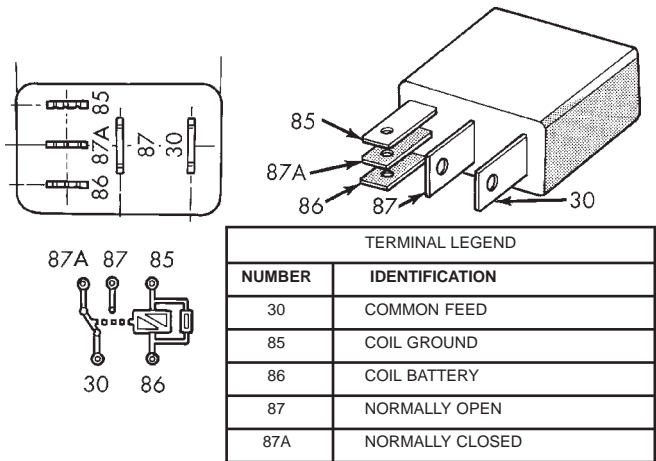


Fig. 2 Horn Relay

RELAY CIRCUIT TEST

- (1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.
- (2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.
- (3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the horn(s). There should be continuity between the cavity for relay terminal 87 and the horn relay output circuit cavity of each horn wire harness connector at all times. If OK, go to Step 4. If not OK, repair the open circuit to the horn(s) as required.
- (4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is connected to battery voltage and should be hot at all times. Check for battery voltage at the cavity for relay terminal 86. If OK, go to Step 5. If not OK, repair the open circuit to the fuse in the PDC as required.
- (5) The coil ground terminal (85) is connected to the electromagnet in the relay. It is grounded

## DIAGNOSIS AND TESTING (Continued)

through the horn switch when the horn switch is depressed. On vehicles equipped with the Remote Keyless Entry (RKE) system, the horn relay coil ground terminal can also be grounded by the Central Timer Module (CTM) in response to certain inputs related to the RKE system or the Vehicle Theft Security System. Check for continuity to ground at the cavity for relay terminal 85. There should be continuity with the horn switch depressed, and no continuity with the horn switch released. If not OK, refer to **Horn Switch** in the Diagnosis and Testing section of this group.

## HORN SWITCH

For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in the Contents of Group 8W - Wiring Diagrams.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

(1) Disconnect and isolate the battery negative cable. Remove the steering column opening cover from the instrument panel.

(2) Check for continuity between the metal steering column jacket and a good ground. There should be continuity. If OK, go to Step 3. If not OK, refer to **Steering Column** in the Removal and Installation section of Group 19 - Steering for proper installation of the steering column.

(3) Remove the driver side airbag module from the steering wheel. Disconnect the horn switch wire harness connectors from the driver side airbag module.

(4) Remove the horn relay from the Junction Block (JB). Check for continuity between the steering column half of the horn switch feed wire harness connector and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted horn relay control circuit to the horn relay in the JB as required.

(5) Check for continuity between the steering column half of the horn switch feed wire harness connector and the horn relay control circuit cavity for the horn relay in the JB. There should be continuity. If OK, go to Step 6. If not OK, repair the open horn relay control circuit to the horn relay in the JB as required.

(6) Check for continuity between the horn switch feed wire and the horn switch ground wire on the driver side airbag module. There should be no conti-

nunity. If OK, go to Step 7. If not OK, replace the faulty horn switch.

(7) Depress the center of the driver side airbag module trim cover and check for continuity between the horn switch feed wire and the horn switch ground wire on the driver side airbag module. There should now be continuity. If not OK, replace the faulty horn switch.

## HORN

For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in the Contents of Group 8W - Wiring Diagrams.

(1) Disconnect the wire harness connector(s) from the horn connector receptacle(s). Measure the resistance between the ground circuit cavity of the horn(s) wire harness connector(s) and a good ground. There should be no measurable resistance. If OK, go to Step 2. If not OK, repair the open ground circuit to ground as required.

(2) Check for battery voltage at the horn relay output circuit cavity of the horn(s) wire harness connector(s). There should be zero volts. If OK, go to Step 3. If not OK, repair the shorted horn relay output circuit or replace the faulty horn relay as required.

(3) Depress the horn switch. There should now be battery voltage at the horn relay output circuit cavity of the horn(s) wire harness connector(s). If OK, replace the faulty horn(s). If not OK, repair the open horn relay output circuit to the horn relay as required.

## REMOVAL AND INSTALLATION

## HORN RELAY

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

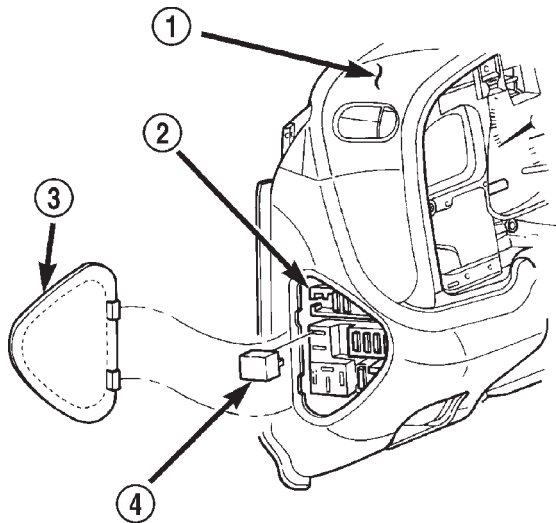
## REMOVAL

(1) Disconnect and isolate the battery negative cable.



## REMOVAL AND INSTALLATION (Continued)

(2) Remove the fuse access panel by inserting a finger in the finger recess molded into the panel and then pulling the panel sharply away from the left outboard end of the instrument panel (Fig. 3).



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**Fig. 3 Horn Relay Remove/Install**

- 1 - INSTRUMENT PANEL
- 2 - JUNCTION BLOCK
- 3 - FUSE ACCESS PANEL
- 4 - HORN RELAY

(3) See the fuse and relay layout label affixed to the inside of the fuse access panel for horn relay identification and location.

(4) Grasp the horn relay firmly and pull it straight out from the JB.

**INSTALLATION**

(1) See the fuse and relay layout label affixed to the inside of the fuse access panel for the proper horn relay location.

(2) Position the horn relay in the proper receptacle in the JB.

(3) Align the horn relay terminals with the terminal cavities in the JB receptacle.

(4) Push in firmly on the horn relay until the terminals are fully seated in the terminal cavities in the JB receptacle.

(5) Insert the tabs on the forward edge of the fuse access panel in the notches on the forward edge of the instrument panel fuse access panel opening.

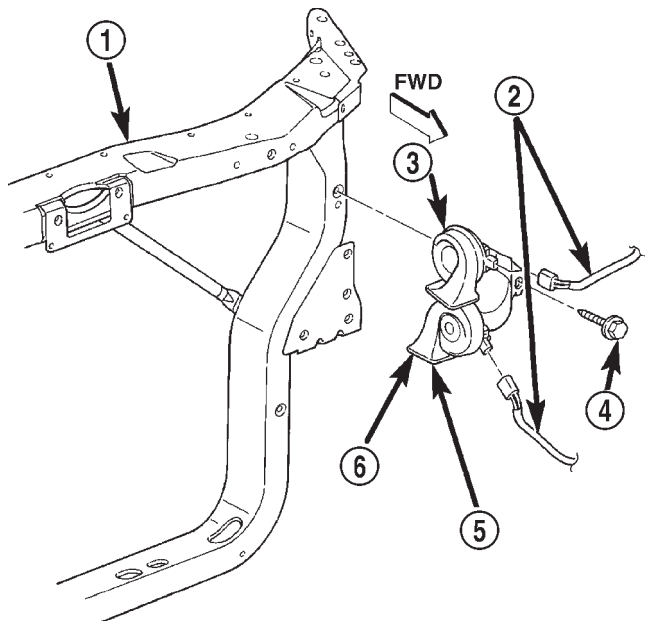
(6) Press the rear edge of the fuse access panel in toward the instrument panel until the panel snaps back into place.

(7) Reconnect the battery negative cable.

**HORN****REMOVAL**

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the headlamp and dash wire harness connectors from the horn connector receptacles (Fig. 4).



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**Fig. 4 Horns Remove/Install**

- 1 - RADIATOR SUPPORT
- 2 - HEADLAMP AND DASH WIRE HARNESS
- 3 - LOW NOTE
- 4 - SCREW
- 5 - HORN AND BRACKET
- 6 - HIGH NOTE

(3) Remove the screw that secures the horn and mounting bracket unit to the front of the left vertical member of the radiator support.

(4) Remove the horn and mounting bracket unit from the radiator support.

**INSTALLATION**

(1) Position the horn and mounting bracket unit onto the front of the left vertical member of the radiator support.

(2) Install and tighten the screw that secures the horn and mounting bracket unit to the radiator support. Tighten the screw to 10.7 N·m (95 in. lbs.).

(3) Reconnect the headlamp and dash wire harness connectors to the horn connector receptacles.

(4) Reconnect the battery negative cable.

